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Tracheal Injury During Transhiatal Mobilization of the Esophagus

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In 50 transhiatal esophageal mobilizations done from 1988 to 1998 at the Cancer Institute (W.I.A.) in Chennai, India, injuries to the trachea were detected on 3 occasions: 1 in a woman with carcinoma of the hypopharnx and 2 in patients (1 male, 1 female) with squamous cell carcinoma of the esophagus. The incidence of tracheal injuries during esophageal mobilization varies in different series. This is usually on the membranous posterior wall of the trachea. When recognized on the table, repair of the rent must be carried out. Persistent air leak through the intercostal tube or surgical emphysema developing over the face and neck in the postoperative period indicates an injury to the airway. A bronchoscopy will reveal the site of injury. If the lung is fully expanded and the stomach abuts the rent completely, the patient may be observed. However, if the lung is collapsed and does not expand on applying negative suction to the intercostal tube or the injury is in the bronchi, the patient is best reexplored to close the rent. With proper case selection and careful dissection of the esophagus, the problem of tracheal injuries can be avoided.
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KEY WORDS: transhiatal dissection; tracheal injury; transhiatal esophageal mobilization

INTRODUCTION

Transhiatal esophagectomy is an alternative to transthoracic esophagectomy for carcinoma of the esophagus to reduce the morbidity associated with the latter procedure. The long-term results are the same. It is also carried out for cancers of the hypopharynx with a gastric pull-up and pharyngogastric anastomosis for restoration of alimentary continuity. It is sometimes carried out for cancers of the esophagogastric junction and cardia of the stomach to avoid an intrathoracic anastomosis. The incidence of injuries to the membranous trachea varies from 0% to as much as 18% [1–3].

MATERIALS AND METHODS

Fifty transhiatal esophageal mobilizations were carried out between 1988 and 1998 at the Cancer Institute. There were three occasions when injuries to the trachea were detected. Two of these were discovered intraoperatively and one postoperatively.

The first was a 45-year-old woman with a postradiation residual squamous cell carcinoma of the hypopharynx. During the cervical dissection a rent was discovered over the bulb of the tracheostomy tube. The tracheostomy tube was replaced by a flexometallic endotracheal tube and the tear repaired by direct suturing. A small defect at the lower end of the rent that could not be accessed through the neck was covered by the stomach that was pulled up into the neck. The patient made an uneventful recovery.

The second was a 55-year-old man with a squamous cell carcinoma of the middle third of the esophagus. A transhiatal mobilization of the esophagus was attempted. A tracheal tear occurred and was brought to attention by the anesthetist, who detected a fall in pressure in her circuit. A right thoracotomy was carried out and the rent repaired. However, the patient died in the postoperative period due to a fulminant chest infection.

The third patient was a 58-year-old woman with a squamous cell carcinoma of the lower third of the

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esophagus. A transhiatal esophagectomy was carried out. A persistent air leak through the intercostal tube was noticed by the evening on the day of surgery. An X-ray of the chest showed a fully expanded lung. Twenty-four hours later, the patient started to develop a surgical emphysema of the neck and the face which progressed dramatically. A bronchoscopy was performed. A 4-cm-long tear was detected commencing about 4 cm below the vocal cords. The stomach was seen along the floor of the tear. A tracheostomy was performed to aid in bronchial toileting. Since the lung remained completely expanded on serial chest X-rays and the patient's parameters including blood gasses were stable, the patient was kept under observation. A broad-spectrum antibiotic cover was instituted and particular attention was paid to chest physiotherapy and toileting. The surgical emphysema started reducing by the 5th postoperative day and the air leak stopped completely by the 8th postoperative day. She made an uneventful recovery thereafter.

DISCUSSION

Tracheal injuries are reported to occur in a variable number of cases during transhiatal mobilization of the esophagus. In a review of 23 articles published on the subject of transhiatal esophagectomy for esophageal cancer between 1981 and 1992, 9 patients (0.67%) of a total of 1,353 patients were found to have had tracheal injuries [1]. In an article from Memorial Sloan-Kettering Hospital, injuries and necrosis of the trachea were reported in 18% (21 patients, of whom 7 had injuries and 14 had tracheal necrosis) of patients undergoing transhiatal mobilization of the esophagus and gastric transposition for head and neck cancer [2]. All the injuries occurred in the earlier part of this series. A low or nil incidence is quoted in other series [3–5]. A consistent fall in this complication occurs as experience is gained with the procedure.

Tracheal injuries occurring during transhiatal mobilization of the esophagus are usually vertical lacerations in the membranous portion of the trachea. Careful case selection, especially in mid and upper thoracic esophageal lesions, is required to prevent this complication. A preoperative CT scan may suggest a tracheobronchial involvement and is mandatory [6]. Lesions adherent to the trachea or the bronchus are best handled through a thoracotomy. This is especially so when adequate experience with transhiatal mobilization has not been acquired by the surgeon. Preoperative radiation therapy may make the dissection difficult [7]. The practice of blind digital mobilization is also best dispensed with. Most of the mobilization can actually be done under direct vision either from the abdomen or the neck. A generous midline phrenotomy greatly aids this exposure. If required, the medial end of the clavicle and part of the manubrium can also be resected to facilitate cervical dissection. Lighted retractors to aid mediastinal visualization could also be used. Visualization may, however, still be a problem in the upper thoracic esophagus and the dissection may have to be blind [8,9]. Any area that does not get mobilized easily must not be forced.

During the procedure, the pressure of the dissecting finger must always be on the esophagus. A nasogastric tube or a bougie placed in the esophagus could be used as a guide. The membranous trachea, being a thin structure, can easily be torn by the dissecting finger. This can happen more easily over the bulb of the endotracheal tube or the tracheostomy tube.

The trachea above the suprasternal notch is also liable to injury. This happens when the esophagus is hooked out from behind the trachea. Following mobilization of the contralateral border of the esophagus, it is hooked by the finger or a right-angled dissector. This must be done before backwards by passing the finger or the clamp anteriorly between the trachea and the esophagus and then around and behind the esophagus. This way the tip of the instrument or finger does not point into the trachea and thereby avoids an inadvertent injury to the trachea.

Intraoperatively the injury is detected when the endotracheal tube or its bulb is visualized through the rent in the posterior wall of the trachea. The anesthesiologist might draw attention to the fact that the pressure in his circuit has fallen due to a possible air leak. Postoperatively the injury may be recognized due to undue or persistent air leak through the intercostal drainage tube. A surgical emphysema of the neck extending to the face and trunk may also develop. A bronchoscopy will reveal the site of injury.

Management of these injuries is an extrapolation of the principles of management of tracheal trauma. Injuries to the trachea detected intraoperatively should be repaired. This can be carried out through the neck if possible. If this is not the case, a right thoractomy and direct repair must be done. A patch of Marlex® (C.R. Bard, Inc., Billerica, MA) or an intercostal muscle flap may be used if required. The stomach transposed into the neck lies posterior to the trachea and buttresses the repair.

If the injury is detected postoperatively, a conservative approach may be justified if the lung remains fully expanded on serial X-rays and the patient maintains oxygenation. This includes broad-spectrum antibiotics, incentive spirometry to help the alveoli expand, good bronchial toileting, and a negative suction to the intercostal tube. The stomach present behind the trachea helps seal the tear. However, if the lung or part of it is collapsed, despite negative suction applied to the intercostal tube, the patient is best reoperated upon to close the tear at the earliest opportunity. A cervical approach or a thoracotomy may be adopted depending on the level of the injury.

CONCLUSIONS

Tracheal injury is a rare complication of transhiatal mobilization of the esophagus. With careful case selection and proper dissection, this can be avoided. Intraoperative recognition mandates repair. Postoperatively detected injuries may be managed conservatively if the lung is completely expanded. A collapsed lung, despite negative suction applied to the intercostal tube, requires reoperation to close the tear.

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